

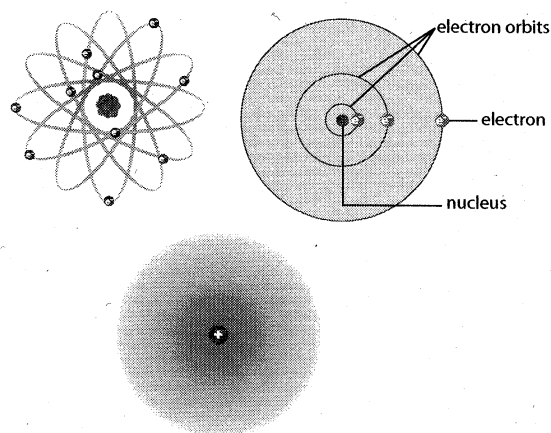
Select the letter of the best answer below.

- 1. K/U** Which of the following did Ernest Rutherford use in his gold foil experiment that helped to establish a new model for the atom?
 - a. a beam of protons
 - a. a cathode ray beam
 - c. a beam of alpha particles
 - d. a beam of X rays
 - e. a beam of beta particles
- 2. K/U** Which “feature” of atomic structure was discovered the earliest?
 - a. the electron
 - b. the proton
 - c. the nucleus
 - d. the orbit
 - e. empty space
- 3. K/U** Which aspect of Rutherford’s and Bohr’s orbits was different?
 - a. Rutherford’s orbits were elliptical and Bohr’s were circular.
 - b. Electrons were in constant motion in Rutherford’s orbits but not in Bohr’s.
 - c. There was empty space between the orbits and the nucleus in Rutherford’s model but not in Bohr’s.
 - d. Electrons gave off energy in Rutherford’s orbits but not in Bohr’s.
 - e. Bohr’s orbits could be called orbitals because they were quantized, but Rutherford’s could not.
- 4. K/U** As Bohr understood them, the dark spaces in the atomic spectrum of hydrogen corresponded to
 - a. the energy between the energy levels inside the atom.
 - b. the energy between the sublevels of energy within each energy level.
 - c. the energy of the excited electrons that did not translate into a quantum leap.
 - d. the space between the energy levels inside the atom; that is, where the electron could be.
 - e. none of the above.
- 5. K/U** Which one of the following means the same as “orbital”?
 - a. orbit
 - b. energy level
 - c. shell
 - d. wave function
 - e. Two of these are correct.
- 6. A** If the 24th electron is the last one filled in an element, which element is it?
 - a. chromium
 - b. titanium
 - c. manganese
 - d. zirconium
 - e. molybdenum
- 7. T/I** Which element, in its ground state, would not have an electron with the quantum numbers $n = 3$, $l = 1$, $m_l = 0$, $m_s = +\frac{1}{2}$ in their atoms?
 - a. calcium
 - b. bromine
 - c. sulfur
 - d. tin
 - e. magnesium
- 8. K/U** Which scientist is responsible for the rule that states only two electrons are allowed in one orbital?
 - a. Bohr
 - b. Schrödinger
 - c. Aufbau
 - d. Pauli
 - e. Hund
- 9. K/U** Which periodic trend increases down a group and decreases across a period?
 - a. electron affinity
 - b. ionization energy
 - c. atomic radius
 - d. atomic number
 - e. None of these are correct.
- 10. T/I** The condensed electron configuration for arsenic is
 - a. $[\text{Ar}]4s^23d^{10}4p^3$.
 - b. $[\text{Ar}]4s^24d^{10}4p^3$.
 - c. $[\text{Kr}]4s^24d^{10}4p^3$.
 - d. $[\text{Kr}]4s^24d^{10}4p^3$.
 - e. $[\text{Ar}]3s^23d^{10}4p^3$.

Use sentences and diagrams as appropriate to answer the questions below.

- 11. T/I** Answer the following questions in your notebook.
 - a. What was the critical finding that suggested the atom contained a smaller particle?
 - b. What was the critical finding that suggested that the particle was negatively charged?
 - c. What was the critical finding that suggested that the same particle was found in all matter?

12. **A** Rutherford's model of the atom has been referred to as "the nuclear model," "the planetary model," and "the beehive model." What are the reasons behind each title? In your opinion, which title is the best one for Rutherford's model? Why?
13. **K/U** What is the difference between a continuous spectrum and a line spectrum?
14. **K/U** Explain how the meaning of n is similar and different in the Bohr and quantum mechanical models of the atom.
15. **A** Arrange the following in order from highest to lowest energy, and justify your answer: $n = 7$, $n = 2$, $n = 5$, $n = 4$, $n = 1$.
16. **K/U** List all of the sets of quantum numbers allowed for the first four energy levels.
17. **K/U** Explain how light and electrons each display characteristics of both particles and waves.
18. **T/I** Answer the following questions.
- Give the possible values for m_l if $n = 4$ and $l = 2$. What type of orbital is associated with these quantum numbers? How many orbitals are associated with these quantum numbers?
 - Give the possible values for m_l if $n = 3$ and $l = 1$. What type of orbital is associated with these quantum numbers? How many orbitals are associated with these quantum numbers?
 - Give the possible values for m_l if $n = 4$ and $l = 0$. What type of orbital is associated with these quantum numbers? How many orbitals are associated with these quantum numbers?
19. **C** Develop a flowchart to outline the steps of the aufbau principle.
20. **T/I** Using a basic periodic table that does not contain electron configurations, determine which element is defined by $[\text{Kr}]5s^24d^7$.
21. **T/I** The condensed electron configuration for a silicon atom is $[\text{Ne}]3s^23p^2$. Without using a periodic table, identify the group number, period number, and orbital block in the periodic table to which silicon belongs. Show your reasoning.
22. **K/U** Answer the following questions.
- What are s -block and p -block elements collectively known as?
 - What are the d -block elements known as?
 - What are the f -block elements known as?
23. **C** Using a graphic organizer such as a triple Venn diagram to record your answers, identify the models of the atoms shown below, name the scientists who developed them, and clearly indicate what the models have in common and how they differ.



Self-Check

If you missed question ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Review section(s)...	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.1	3.1	3.2	3.1	3.2	3.2	3.2	3.3	3.3	3.1	3.1	3.3	3.1	3.3	3.3